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ABSTRACT

The manual lists program objectives for the math curriculum at Kendall Demonstration Elementary School for hearing impaired students, objectives are grouped by age (preschool: grades 1, 2, 3, 4, 5, and 6). Objectives are organized into eight strands: relations (likenesses and differences among sets and numbers and on the order of sets and numbers); numbers (meanings of cardinal, ordinal, fractional, and decimal numbers); measurements (of time, distance, volume, weight, area, and money); operations (processes related to addition, subtraction, multiplication, and division); number theory (including identifying odd and even numbers); place value (decimal system); geometry (identifying, classifying, and comparing standard figures by analyzing their properties); and problem solving. Charts at the back depict the order in which objectives should be worked on for each age level. A review of evaluation findings in terms of scholarship, usefulness, equity, communicability, appeal, and overall quality is provided. (CL)

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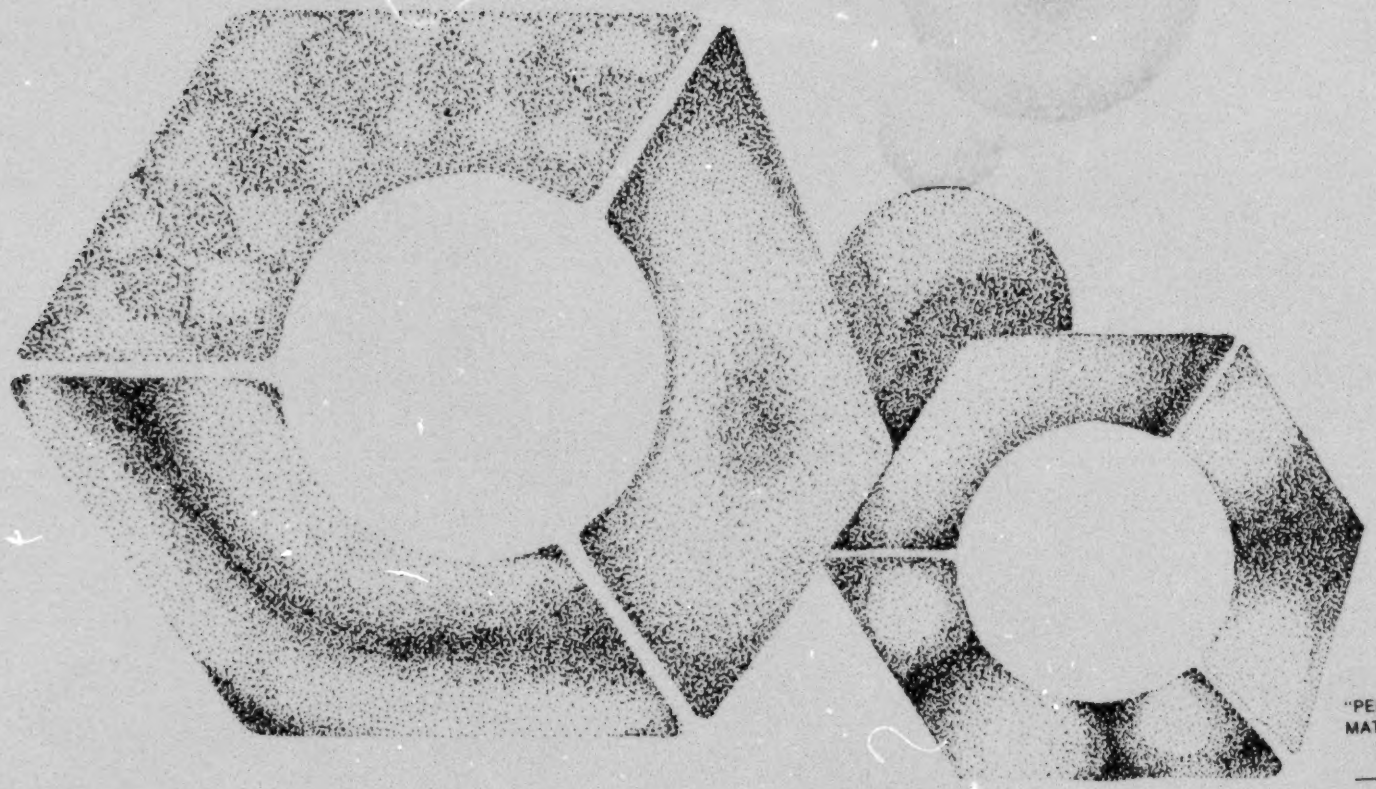
Program Objectives for Mathematics



Kendall Demonstration Elementary School
Gallaudet College

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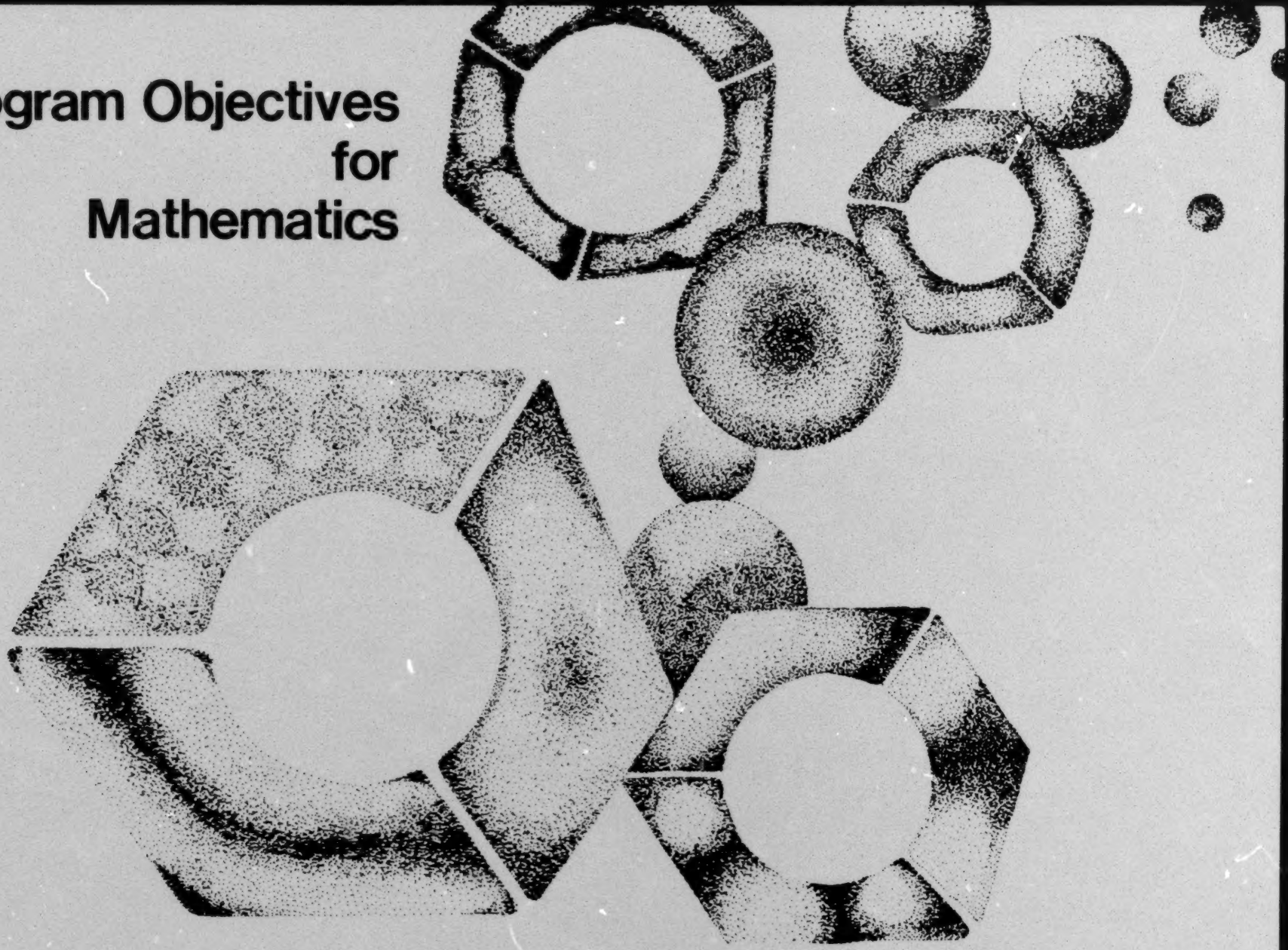

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INTRODUCTION

PROGRAM OBJECTIVES FOR MATHEMATICS

The Program Objectives for Mathematics were developed with two purposes in mind:

(1) to aid the teacher in choosing appropriate objectives for math instruction; and
(2) to provide a method of charting student progress on selected objectives (Preschool through Sixth Grade).

It is recognized that the grade levels assigned to these objectives may or may not correspond with grade levels in individual schools. (In most instances, the objectives represent a higher grade level than the one assigned). Upon completion of the objectives in this Guide, textbooks that meet the needs of the students should be selected and should become the basis for instruction. There has been no attempt to suggest methods or materials for teaching specific objectives, thereby making it possible to use this guide with almost any math program.

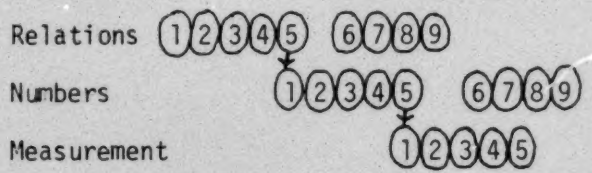
The mathematics objectives are organized into eight major strands: RELATIONS, NUMBERS, MEASUREMENT, OPERATIONS AND THEIR PROPERTIES, NUMBER THEORY, PLACE VALUE, GEOMETRY AND PROBLEM SOLVING. For a description of each of these strands, see Page viii.

The networks serve a dual purpose: they suggest a teaching sequence; and they serve as a record of individual student progress. Two features that should be kept in mind are:

(1) THE NETWORKS ARE SET UP WITH A LEFT TO RIGHT PROGRESSION; and

(2) ARROWS BETWEEN TWO OBJECTIVES INDICATE THAT IT IS SUGGESTED THAT ONE BE TAUGHT BEFORE THE OTHER.

Example: At the Preschool/Kindergarten Level:



The example suggests that the first objectives in Relations be taught before the first objectives in Numbers are taught.

Likewise, Numbers objective 5 should be taught before teaching Measurement objective 1.

Although the objectives are listed in a progression and by grade level, it is not mandatory that they be taught in this sequence.

On each level, special attention should be given to the Problem Solving strand. The teacher is strongly encouraged to utilize every real experience for allowing students to apply math skills.

While KDES is currently using Mathematics (Boston: Houghton Mifflin Publishing Company, 1978) as its math text, this guide is not limited to use with this series. Some other possible series and materials are listed in the Bibliography.

It is recognized that the grade levels assigned to these objectives may or may not correspond with grade levels in individual schools. (In most instances, the objectives represent a higher grade level than the one assigned.) Upon completion of these objectives, textbooks that meet the needs of the students should be selected and should become the basis for instruction.

NOTE. Some objectives require a student to perform the objective using metric measure; some, Standard English measure. An M after the objective number indicates metric; an S indicates Standard English measure.

The following individuals served on a committee during the Summer of 1978 to revise the Program ojectives for Mathematics:

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STRAND ORGANIZATION

The mathematic objectives are organized into eight major strands: Relations, Numbers, Measurement, Operations, Number Theory, Place Value, Geometry and Problem Solving. Following is a brief description of the objectives in each strand.

Relations:	focuses on likenesses and differences among sets and numbers and on the order of sets and numbers.
Numbers:	emphasizes the meanings of cardinal, ordinal, fractional, and decimal numbers.
Measurements:	concentrates on measurements of time, distance, volume, weight, area and money. Both metric and standard units of measurement are included. (It is recommended that students not convert between these two systems.)
Operations:	covers the processes related to addition, subtraction, multiplication, and division and the relationship of these operations to each other. Computational skills and estimation are also in this strand.
Number Theory:	includes skip counting, identifying odd and even numbers, and finding multiples, factors, and divisors.
Place Value:	involves a study of our decimal system of numeration.
Geometry:	requires the student to identify, classify, compare and contrast standard geometric figures by analyzing their properties.
Problem Solving:	stresses the use of relevant situations and the student's linguistic and mathematical level of competence in problem solving activities. This objective is represented on each level K-6. (1.k, 1.1, 1.2, etc.)

PRESCHOOL/KINDERGARTEN

Relations

_____R1 Compare identical and non-identical objects to determine whether they are the "same" or "different" (through the air).

_____R2 Identify the object that is "different" in a collection of three or more objects (through the air).

_____R3 Use one-to-one matching (up to five objects).

_____R4 Use one-to-one matching to determine whether two sets have the same number of members (up to five objects).

_____R5 Use one-to-one matching to determine which set has more members and which has fewer members (up to five objects).

_____R6 Compare two similar objects to determine which is "longer" and which is "shorter."

_____R7 Compare two similar objects to determine which is "larger" and which is "smaller."

_____R8 Compare two similar objects to determine which is "taller" and which is "shorter."

_____R9 Compare two similar objects to determine which is "heavier" and which is "lighter."

_____R10 Distinguish between a "whole" and a "part," using objects and sets of objects.

_____R11 Compare two objects using two or more of the attributes named above.

Numbers

_____N1 Associate the numbers one to five with sets containing 1-5 objects (through the air).

_____N2 Identify sets containing 1-5 members using the written numerals 1-5.

_____N3 Form sets having 1-5 members to correspond to the numerals 1 to 5.

_____N4 Match the numerals 1-5 with corresponding sets of objects.

mbers

___N5 Count in sequence from 1 to 5 (through the air and written).

___N6 Associate the numbers six to ten with sets containing 6-10 objects (through the air).

___N7 Identify sets containing 6-10 members and recognize the numerals 6 to 10.

___N8 Form sets having 6-10 members to correspond to the numerals 6 to 10.

___N9 Match the numerals 6 to 10 with corresponding sets of objects.

___N10 Count in sequence from 6 to 10 (through the air and written).

___N11 Count backwards from 10 to 1 (through the air and written).

___N12 Associate the quantity 1/2 with a pictorial representation and with objects.

asurement

___MS1 Match the numerical form "1¢" with a penny (through the air and read).

___MS2 Identify sets of one to five pennies (through the air and read).

___MS3 Match the numerical form "5¢" with a nickel (through the air and read).

___MS4 Exchange five pennies for one nickel.

___MS5 Make change for a nickel by continuing the count to 5¢.

___MS6 Identify amounts of pennies to ten cents (through the air and read).

___MS7 Tell age beginning at age 3.

___MS8 Use the calendar to refer to dates.

Measurement

_____MS9 Look to the clock as a frame of reference.

_____MS10 Relate specific activities to the appropriate times.

OPERATIONS AND THEIR PROPERTIES

_____OP1 Join two sets of objects whose sum is less than or equal to 10 and determine the number of objects in the resulting set.

_____OP2 Determine how many objects remain in a set of ten or less after one or more objects have been removed.

PROBLEM SOLVING

_____PS1 Given a familiar "life" situation appropriate to the student's linguistic level and at the student's mathematical level, the student will:

a. express the problem mathematically
b. solve the problem
c. determine if the solution is correct or at least reasonable.

_____PS2 Solve simple problems that involve measurements.

_____PS3 Use addition or subtraction to solve rebus problems.

FIRST GRADE

Relations

_____R12 Demonstrate the three basic numerical relations of "greater than," "less than," and "equal to," using concrete objects and pictorial representations.

_____R13 Arrange sets from the smallest to the largest and from the largest to the smallest.

_____R14 Use the symbols $>$, $<$, and = to compare whole numbers less than 10.

_____R15 Classify elements of a set according to specified properties such as shape, size, length, etc.

_____R15 Read a pictograph.

Numbers

_____N13 Write the numeral that immediately comes before or after any given number in the sequence of whole numbers from 2 to 10.

_____N14 Read the words that name the numbers one through ten.

_____N15 Write the words that name the numbers one through ten.

_____N16 Count from 1 to 30 (through the air and written).

_____N17 Associate the numbers one through thirty with sets containing 1-30 objects (through the air and written).

_____N18 Write the numeral that immediately comes before or after a number in the sequence of whole numbers from 2 to 30.

_____N19 Construct a number line using the whole numbers from 1 to 30.

_____N20 Read and apply the ordinal numbers first through tenth.

Numbers

_____N21 Write the words that name the ordinal numbers first through tenth.

_____N22 Associate the number zero with the set containing no objects.

_____N23 Associate the quantities 1/2, 1/3, 1/4 with real objects and/or pictorial representations.

_____N24 Count to 100 by 1's (through the air and written).

_____N25 Write the numeral that immediately comes before or after any number in the sequence of real numbers from 1 to 100.

Measurement

_____MS11 Match the numerical form "10¢" with a dime (through the air and written).

_____MS12 Form equivalents for a dime using nickels and/or pennies.

_____MS13 Make change for a dime by "continuing the count" to 10¢.

_____MS14 Determine the measurement of an object in terms of a non-standard unit (e.g., pencil or paper clip lengths).

_____MS15M Measure length in terms of

a. centimeters
b. decimeters

_____MS15S Measure length in terms of inches.

_____MS16 Tell time to the hour and the 1/2 hour (through the air and written).

Number Theory

_____NT1 Count to 100 by 10's (through the air and written).

Operations And Their Properties

_____OP3 Demonstrate the meaning of addition using manipulative aids and using a diagram.

_____OP4 Relate the process of joining sets and the addition sign (+) to each other.

_____OP5 Memorize the addition facts for sums up to ten in horizontal and vertical forms.

_____OP6 Apply the commutative property of addition (3+2 = 2+3).

_____OP7 Relate the process of taking away and the subtraction sign (-) to each other.

_____OP8 Memorize the subtraction facts for sums up to ten in horizontal or vertical form.

_____OP9 Perform addition and subtraction when presented simultaneously.

Place Value

_____PV1 Tell the value of each digit in a 2-digit number (through the air and written).

Geometry

_____G1 Identify circles, triangles, rectangles, and squares (through the air).

Problem Solving

_____PS1.1 Given a familiar "life" situation appropriate to the student's linguistic level and at the student's mathematical level, the student will:

a. express the problem mathematically
b. solve the problem
c. determine if the solution is correct or at least reasonable

_____PS2.1 Solve simple problems that involve measurements.

_____PS4 Write an equation for a given picture story.

SECOND GRADE

elations

___R17 Interpret a table.

___R18 Interpret a bar graph and a pictograph.

___R19 Use the symbols $>$, $<$, and = to compare number sentences (e.g., 5-2 ☐ 6+3).

___R20 Use the symbols $>$, $<$, and = to compare fractions (using pictorial representations).

___R21 Record relations using diagrams and mappings (arrow diagrams).

___R22 Record relations using tables and graphs.

mbers

___N26 Associate the quantities 1/2, 1/3, 1/4, 2/3, 3/4 with pictorial representations.

___N27 Write the numerals 0 to 500.

___N28 Write the numerals in order from 501 to 1000.

___N29 Read the words that name the numbers eleven through twenty.

___N30 Write the words that name the numbers eleven through twenty.

easurement

___MS17 Form equivalents for a quarter using pennies, nickels, and/or dimes.

___MS18 Match the numerical form "25¢" with a quarter (through the air and written).

Measurement

_____MS19 Make change for a quarter by "continuing the count" to 25¢.

_____MS20 Form equivalents for a half-dollar using pennies, nickels, dimes, and/or quarters.

_____MS21 Match the numerical form "50¢" with a half-dollar (through the air and written).

_____MS22 Make change for a half-dollar by "continuing the count" to 50¢.

_____MS23 Form equivalents for a dollar using pennies, nickels, dimes, quarters, and/or half-dollars.

_____MS24 Match the numerical form "$1.00" with a dollar (through the air and written).

_____MS25 Make change for a dollar by "continuing the count" to $1.00.

_____MS26 Use dimes, nickels, and pennies to represent monetary values to 100 cents.

_____MS27M Measure volume in liters.

_____MS27S Measure volume in:

a. cups
b. pints
c. quarts

_____MS28 Tell time to the quarter hour (through the air and written).

Number Theory

_____NT2 Count to 100 by 5's (through the air and written).

_____NT3 Count to 100 by 2's (through the air and written).

Number Theory

_____NT4 Count to 1,000 by 100's (through the air and written).

_____NT5 Count to 1,000 by 25's and 50's (through the air and written).

Operations And Their Properties

_____OP10 Determine that the sum of 0 and a number is the same as that number.

_____OP11 Add three numbers whose sum is less than 10 horizontally and vertically.

_____OP12 Apply the associative property of addition (3+1)+4 = 3+(1+4).

_____OP13 Add two numbers (multiples of 10) whose sum is 90 or less.

_____OP14 Add two two-digit numerals presented horizontally and vertically (no regrouping).

_____OP15 Add three two-digit numerals presented horizontally and vertically (no regrouping).

_____OP16 Add one-, two-, three-digit numerals without regroupings.

_____OP17 Memorize basic addition facts for sums through 18 in horizontal and vertical forms.

_____OP18 Determine that 0 subtracted from a number results in the same number.

_____OP19 Subtract with multiples of ten.

_____OP20 Subtract two 2-digit or 3-digit numerals (no regroupings).

_____OP21 Memorize the subtraction facts for sums up to 18 in horizontal and vertical form.

_____OP22 Relate the process of finding the missing addend and the subtraction sign (-) to each other.

_____OP23 Given the sum and one addend, use the inverse operation to find the missing addend.

Place Value

_____PV2 Tell the value of each digit in a 3-digit number (through the air and written).

_____PV3 Write expanded numerals for 3-digit numbers.

_____PV4 Tell the value of each digit in a 4-digit number (through the air and written).

Geometry

_____G2 Distinguish between the inside and the outside of simple closed geometric figures (through the air and written).

_____G3 Read the words "circles," "triangles," "rectangles," "squares."

Problem Solving

_____PS1.2 Given a familiar "life" situation appropriate to the student's linguistic level and at the student's mathematical level, the student will:

a. express the problem mathematically
b. solve the problem
c. determine if the solution is correct or at least reasonable

_____PS2.2 Solve simple problems that involve measurements.

THIRD GRADE

Relations

_____R23 Interpret a line graph.

_____R24 Use the term "set" to describe the common characteristics of the members of a set.

Numbers

_____N31 Read the words that name the numbers twenty-one through one hundred.

_____N32 Write the words that name the numbers twenty-one through one hundred.

_____N33 Read and apply the ordinal numbers eleventh through thirtieth.

_____N34 Write the words that name the ordinal numbers eleventh through thirtieth.

_____N35 Identify the number that immediately comes before or after a given number in a skip-counting sequence (by tens, hundreds, and thousands) from 0 to 1,000,000 (through the air and written).

_____N36 Demonstrate the meaning of a fractional numeral by using:

a. physical objects
b. a pictorial representation
c. a number line

_____N37 Write the fractional numeral associated with representations of 1/2, 1/3, 1/4, 2/3, 2/4, 3/4.

_____N38 Read and write the words that name the fractional numerals.

_____N39 Explain the meaning of "numerator" and "denominator" in relation to the whole.

_____N40 Use the words "numerator" and "denominator."

Measurement

_____MS29 Tell time in 5-minute intervals (through the air and written).

_____MS30 Read the words "penny," nickel," "dime," "quarter," half-dollar," "dollar," "coin," and "bill."

_____MS31 Write the value in dollars and cents of arrays of money consisting of dollars, half-dollars, quarters, dimes, nickels, and pennies.

_____MS32 Determine the number of nickels, dimes, quarters, and/or half-dollars needed to make a specified amount of money.

_____MS33M Measure in length in:

a. millimeters
b. meters

_____MS33S Measure length in:

a. feet
b. yards

_____MS34M Measure volume in millimeters.

_____MS34S Measure volume in:

a. teaspoons

b. tablespoons

_____MS35M Measure temperature in degrees centigrade.

_____MS35S Measure temperature in degrees fahrenheit.

_____MS36M Measure weight in:

a. grams

b. kilograms

Measurement

____MS36S Measure weight in:

a. pounds
b. ounces

____MS37 Select an appropriate unit and measuring tool for a specific task.

____MS38 Determine the area of a given figure by counting the number of square units.

____MS39 Determine the perimeter of a given figure.

____MS40 Tell time to the minute (through the air and written).

Operations And Their Properties

____OP24 Relate the process of comparing and the subtraction sign (-) to each other.

____OP25 Relate the process of finding the difference and the subtraction sign (-) to each other.

____OP26 Add a two-digit numeral and a one-digit numeral with regrouping.

____OP27 Add two 2-digit numerals with regrouping.

____OP28 Perform addition (presented on the same page) with and without regrouping.

____OP29 Subtract a one-digit numeral from a two-digit numeral with regrouping.

____OP30 Subtract a two-digit numeral from a two-digit numeral with regrouping.

____OP31 Perform subtraction (presented on the same page) with and without regrouping.

____OP32 Use the inverse operations of addition and subtraction to check computations.

____OP33 Perform addition and subtraction with 2-digit numerals with and without regrouping.

____OP34 Add two 3-digit numerals with regrouping in the hundreds place.

Operations And Their Properties

_____OP35 Add two 3-digit numerals with regrouping in the hundreds and tens place.

_____OP36 Subtract two 3-digit numerals with regrouping in the hundreds place.

_____OP37 Subtract numbers with regrouping in the hundreds and tens place.

_____OP38 Relate the process of repeated addition and the multiplication sign (x) to each other.

_____OP39 Relate the process of forming an array of objects in rows and columns and the multiplication sign (x) to each other.

_____OP40 Memorize the basic multiplication facts with 0-5 as a factor.

_____OP41 Memorize the basic multiplication facts with 6-10 as a factor.

_____OP42 Apply the commutative property of multiplication (3x5 = 5x3) horizontally and vertically.

_____OP43 Multiply a two-digit numeral by a one-digit numeral with no regrouping.

_____OP44 Multiply a two or three-digit numeral by a one-digit numeral with no regrouping.

_____OP45 Apply the associative property of multiplication (3x5)x2 = 3x(5x2).

_____OP46 Relate the process of repeated subtraction and the division signs (÷, ⌐) to each other.

_____OP47 Relate the process of dividing into equivalent sets and the division signs (÷, ⌐) to each other.

_____OP48 Relate the process of dividing a given set into a given number of subsets and the division signs (÷, ⌐) to each other.

_____OP49 Memorize the basic division facts with 1-5 as a divisor and a quotient from 0-9.

_____OP50 Memorize the basic division facts with 6-10 as a divisor and a quotient from 0-9.

_____OP51 Divide using basic facts with remainders.

_____OP52 Given the product and one factor, use the inverse operation to find the missing factor.

_____OP53 Use the inverse operations of multiplication and division to check computations.

Place Value

____PV5 Convert Arabic numerals 1 through 12 to Roman numerals and vice versa.

Geometry

____G4 Identify a point, a line, and a line segment (through the air and read).

Problem Solving

____PS1.3 Given a familiar "life" situation appropriate to the student's linguistic level and at the student's mathematical level, the student will:

a. express the problem mathematically
b. solve the problem
c. determine if the solution is correct or at least reasonable

____PS2.3 Solve problems that involve measurements.

____PS5 Solve simple problems that involve money.

FOURTH GRADE

____R25 Prepare a bar graph or pictograph using collected data.

____R26 Locate objects or coordinates on a grid.

____R27 Name the coordinates for a given point on a number plane.

____R28 Use $>$, $<$, or = to compare two whole numbers greater than 100.

____R29 Find the missing element of a pair when one number of the pair and the relation are given.

____R30 Find some pairs of elements when a relation is given.

lumbers

____N41 Name a fraction equivalent to a given fraction.

____N42 Rewrite whole numbers and mixed numbers as fractions.

____N43 Convert an improper fraction to a whole or mixed numeral.

____N44 Write fractions in their simplest forms.

leasurement

____MS41 Round monetary amounts to the nearest dollar or 10¢ in order to estimate a sum.

____MS42 Make change using "continuous counting" for amounts up to $10.00.

____MS43 Express time using "a.m." and "p.m." (through the air and written).

Number Theory

_____NT6 Identify even and odd numbers.

_____NT7 List multiples of a number.

_____NT8 Name the set of factors (divisors) of a number.

_____NT9 Identify a prime and a composite number.

Operations And Their Properties

_____OP54 Perform addition with numbers less than 100,000 regrouping as many times as necessary.

_____OP55 Perform subtraction with numbers less than 100,000 regrouping as many times as necessary.

_____OP56 Estimate a difference by rounding the numbers involved before completing the exact calculation.

_____OP57 Estimate a sum by rounding the numbers involved before completing the exact calculation.

_____OP58 Add and subtract fractions having the same denominator using the vertical and horizontal forms.

_____OP59 Add and subtract mixed numbers with fractions having the same denominator in vertical and horizontal forms (without regroupings).

_____OP60 Multiply a 2-or 3-digit numeral by a one-digit numeral with regrouping.

_____OP61 Estimate a product by rounding the numbers involved before completing the exact calculation.

_____OP62 Divide a 2-or 3-digit numeral by a one-digit numeral with no remainder.

_____OP63 Divide a 2-or 3-digit numeral by a one-digit numeral with a remainder.

_____OP64 Divide using a one-digit divisor so that one of the digits in the quotient is a zero.

_____OP65 Estimate a quotient by rounding the numbers involved before completing the exact calculation.

Operations And Their Properties, cont'd.

____OP66 Write the quotient of a division problem as a mixed number.

____OP67 Multiply a 2-or 3-digit numeral by a 2-digit number.

____OP68 Multiply a 2-or 3-digit numeral by a multiple of ten.

____OP69 Multiply a 3-digit numeral by a 3-digit numeral.

____OP70 Multiply a numeral by a 3-digit numeral containing zero in the ten's place.

____OP71 Recognize the multiplication sign (·).

____OP72 Divide a 2-, 3-, or 4-digit numeral by a 2-digit numeral with or without remainders.

Place Value

____PV6 Tell the value of each digit in a numeral $\leq$ 1,000,000.

____PV7 Read numbers up to 1,000,000.

____PV8 Round a whole number $\leq$ 1,000,000 to the nearest ten, hundred, and/or thousand.

Geometry

____G5 Identify a ray and an angle.

____G6 Identify the sides and angles of a triangle, rectangle and a square.

____G7 Identify figures with lines of symmetry.

Problem Solving

_____PS1.4 Given a familiar "life" situation appropriate to the student's linguistic level and at the student's mathematical level, the student will:

a. express the problem mathematically
b. solve the problem
c. determine if the solution is correct or at least reasonable

_____PS2.4 Solve simple problems that involve measurements.

_____PS6 Determine the average of a set of numbers.

FIFTH GRADE

Relations

____R31 Interpret data on a circle graph.

____R32 Use the symbol $>$, $<$, or = to compare any two fractions.

____R33 List the members of a described set.

____R34 Use the term "empty set."

____R35 Identify a subset of a given set.

____R36 Identify the union of two sets.

____R37 Identify the intersection of two sets.

____R38 Use the term "congruent" to describe two figures that have the same size and shape.

____R39 Use the term "similar" to describe two figures that have the same shape.

____R40 Describe the relation when a set of ordered pairs is given.

Numbers

____N45 Demonstrate the meaning of a decimal numeral by using:

a. a pictorial representation
b. a number line

____N46 Read and write decimals to hundredths place.

____N47 Rewrite a fraction in decimal notation to the nearest thousandth.

____N48 Rewrite a number in decimal notation in fraction form.

Measurement

____MS44 Count the cubes to name the volume of a solid figure.

____MS45S Measure volume in gallons and half gallons.

____MS46M Measure length in kilometers.

____MS46S Measure length in miles.

Number Theory

____NT10 Name the greatest common factor of two numbers.

____NT11 Name the least common multiple for two numbers.

Operations And Their Properties

____OP73 Apply the distributive property $3x(5+2) = (3x5) + (3x2)$.

____OP74 Demonstrate the meanings of multiplication (repeated addition and rows and columns) by using manipulative aids and by using a diagram.

____OP75 Demonstrate the four meanings of subtraction (take away, finding the missing addend, comparing, and finding the different meanings of subtraction) by using manipulative aids and by using diagrams.

____OP76 Demonstrate the three meanings of division (repeated subtraction, making equivalent sets, and separating into a given number of sets) by using manipulative aids and by using diagrams.

____OP77 Add and subtract fractions (horizontally and vertically) with like denominators and write the resulting sum or difference in simplest form.

____OP78 Subtract a fraction from a whole number.

__OP79 Subtract a mixed number from a whole number.

__OP80 Add and subtract mixed numbers with fractions having like denominators in vertical and horizontal forms (with regrouping).

__OP81 Determine a common denominator for a pair of fractions.

__OP82 Find the least common denominator for a pair of fractions.

__OP83 Add and subtract (fractions) with unlike denominators.

__OP84 Add and subtract mixed numbers with unlike denominators.

__OP85 Multiply a fraction by a whole number and a whole number by a fraction.

__OP86 Multiply two fractions and write the product in its simplest form.

__OP87 Multiply a mixed number by a fraction and a fraction by a mixed number.

ce Value

__PV9 Round any decimal number to the nearest whole number.

metry

__G8 Identify a cube, a cylinder, a cone, a sphere, and a pyramid.

__G9 Identify parallel and perpendicular lines and line segments.

__G10 Construct perpendicular lines, parallel lines, and perpendicular bisectors.

Problem Solving

_____PS1.5 Given a familiar "life" situation appropriate to the student's linguistic level and at the student's mathematical level, the student will:

a. express the problem mathematically
b. solve the problem
c. determine if the solution is correct or at least reasonable

_____PS2.5 Solve simple problems that involve measurements.

_____PS7 Solve simple problems that involve fractions.

lations

__R41 Interpret and plot data on a linear graph.

__R42 Prepare a linear graph using collected data.

__R43 Prepare a circle graph using collected data.

__R44 Use the symbols $>$, $<$, or = to compare decimal numerals.

__R45 Apply equivalence relations to elements such as fractions, ratios, and geometric figures.

__R46 Graph equalities on a coordinate plane.

__R47 Record relations in:

a. set notation
b. sentences
c. formulas
d. mappings
e. tables
f. graphs

__R48 Graph inequality relations on a number line.

__R49 Graph inequality relations on a coordinate plane.

nbers

__N49 Write a ratio to express a comparison in three ways (2 to 5), (2:5), $(\frac{2}{5})$.

__N50 Write a percent for a ratio expressed as hundredths and write a ratio as a percent.

__N51 Write a decimal numeral as a percent and write a percent as a decimal numeral.

__N52 Write a simplified fraction as a percent and write a percent as a fraction.

Measurement

____MS47 Use formulas to compute the areas of rectangles and squares.

____MS48 Use formulas to compute the perimeters of rectangles and squares.

____MS49 Use a protractor to measure and compare angles.

____MS50 Use formulas to compute the area of parallelograms and triangular regions.

____MS51 Use formulas to compute the volumes of rectangular prisms.

____MS52M Relate and convert within metric linear measurements (millimeters, centimeters, decimeters, meters, kilometers).

____MS52S Relate and convert within standard linear measurements (inches, feet, yards, miles).

____MS53M Relate and convert within metric volume measurements (milliliters, liters).

____MS53S Relate and convert within standard volume measurements (cups, pints, quarts, gallons).

____MS54 Give a reasonable estimate of length, area, and volume in specified units.

____MS55M Use the correct abbreviations for the metric units.

____MS55S Use the correct symbols and abbreviations for the standard units.

Operations And Their Properties

____OP88 Divide a fraction by a whole number.

____OP89 Divide a whole number by a fraction and a fraction by a whole number.

____OP90 Divide a fraction by a fraction and write the quotient in its simplest form.

____OP91 Divide a mixed number by a fraction and a fraction by a mixed number.

____OP92 Add and subtract decimals to thousandths place.

Operations And Their Properties

____OP93 Find the product of a whole number and a decimal.

____OP94 Find the product of two decimals.

____OP95 Divide a decimal by a whole number.

____OP96 Divide using a decimal as the divisor.

Place Value

____PV10 Round any decimal number to the nearest tenth, hundredth or thousandth.

Geometry

____G11 Identify figures with point-symmetry.

____G12 Identify planes and simple curves.

____G13 Identify right angles.

____G14 Identify a polygon, including a triangle, a quadrilateral, a pentagon, a hexagon, and an octagon.

____G15 Identify a diagonal of a four-sided figure.

____G16 Construct an angle bisector.

____ G17 Identify the radius and diameter of a circle.

____G18 Classify scalene, isosceles, and equilateral triangles.

____G19 Identify the faces, edges, and corners of rectangular prisms.

Problem Solving

_____PS1.6 Given a familiar "life" situation appropriate to the student's linguistic level and at the student's mathematical level, the student will:

a. express the problem mathematically
b. solve the problem
c. determine if the solution is correct or at least reasonable

_____PS2.6 Solve simple problems that involve measurements.

_____PS8 Solve simple problems which require the basic ruler and compass constructions.

_____PS9 Solve simple problems that involve decimals.

_____PS10 Solve simple problems that involve percent.

_____PS11 Solve simple problems that involve ratio.

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EVALUATION REPORT

PROGRAM OBJECTIVES FOR MATHEMATICS
KENDALL DEMONSTRATION ELEMENTARY SCHOOL

Prepared by Richard Sinatra
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Pre-College Programs
Division of Educational Resources
Instructional Development and Evaluation Center

July, 1980

Background

n the summer of 1977, a mathematics committee comprised of Kendall faculty mem-
ers revised the 1976 prototype edition of the mathematics guide. Later, during
978, the guide underwent further revisions with the assistance of an MSSD mathe-
atics teacher and an outside consultant.

he entire developmental process for the Program Objectives for Mathematics can be
pelled out in a sequence of steps:

- beginning development by program supervisors,
- continuing development by a committee of classroom teachers,
- reaction and modification by selected personnel from other schools in concert with the KDES committee,
- usage by teachers,
- critique conducted by Media Development Project for the Hearing Impaired (MDPHI) using external reviewers,
- modification by the KDES committee,
- usage by teachers,
- critique by external reviewers,
- revisions based on critiques, and
- publishing of the guide.

he purpose of this report is to detail the external review critique and subsequent
ccompanying revisions.

Reviewers

hree persons served as external reviewers of the KDES Program Objectives for
athematics. Two are teachers in the Mathematics Department of Gallaudet College;
he other is a mathematics teacher at the MSSD.

Purposes of This Report

his report is intended to serve the following groups or persons:

1) members of Pre-College Programs as they make dissemination decisions,

2) users of the curriculum guide both at KDES and in other educational settings, and

3) persons responsible for on-going development of the Mathematics Program at KDES.

Evaluation Information Collected

he form used by the reviewers of the KDES Program Objectives for Mathematics is an daptation of a form developed by the National Center for Research in Vocational Ed- cation (NCRVE) and used by the Pre-College Editorial Board at Gallaudet. On this orm, reviewers are first encouraged to make specific comments and changes directly n the Program Objectives. They are then asked to summarize their comments and rate he program guide in the areas of scholarship, usefulness, equity, communicability, ppeal, and overall quality. They then highlight what they perceive to be the major trengths of the program guide and give specific recommendations for improvement.

Evaluation Results

t can be stated that the two reviewers at Gallaudet offered few criticisms of the uide and, as such, were in wide disagreement with the MSSD reviewer. This third eviewer commented freely throughout the guide. Specific ratings of each reviewer re provided below. (NOTE: The first and second reviewers refer to the Gallaudet eaders, the third to the MSSD reviewer.)

cholarship

he criteria for scholarship were: accuracy, balance, focus, and methodology.

The first reviewer commented only that he/she was unaware of the KDES curriculum and, therefore, could not make judgments regarding accuracy. The second reviewer voiced positive remarks for scholarship, balance, and methodology and added the following statements/questions:

1) Similar to the first reviewer, the second was unaware whether the guide accurately reflected the KDES curriculum;

2) It is difficult to judge what is most significant and what should receive major focus;

3) It is difficult to judge what are the key points (methodology - objectives).

The third reviewer offered the following comments:

1) Additional work on development, sequencing is needed. As an example, this reviewer felt that insufficient conceptual work on fractions was included before computation. As a second illustration, it was felt that the use of hands-on activities as a prerequisite to symbol manipulation did not receive sufficient focus;

2) Consistent with the other reviewers, no comments were made relating to the purported correspondence between the present curriculum and the guide;

3) There seemed to be considerable emphasis on computation and less on concept development/application;

4) Most objectives appeared vague and need to be made more specific.

In terms of rating this first set of criteria dealing with scholarship, the first two reviewers gave it a "4" (Very Good). The third reviewer rated the overall scholarship quality as "2" (Fair). Possible ratings ranged from 1 (Poor) to 5 (Excellent).

Usefulness

The criteria for usefulness were: practicality, durability, flexibility, and user centered.

The first reviewer commented only that the guide appeared to facilitate the use of its parts, that it contained flexibility. The second reviewer voiced positive remarks in response to all criteria within this second set.

The third reviewer offered the following comments:

1) It would be difficult for an elementary level teacher to use the guide as a major resource for instruction;

2) Insufficient guidance is given to the teacher - therefore, application has not been maximally facilitated;

3) The guide's format and record keeping system appear quite useful;

4) Responsiveness to user needs could be demonstrated if introductory material was added.

Equity

The criteria for equity were: generic he/she, universal "man," and avoids demeaning usage or stereotype roles.

The first reviewer had no comments whatsoever for this set of criteria. The second reviewer voiced positive remarks in response to all criteria within the third set. The third reviewer responded positively to its general equity, and had no additional statements.

In terms of rating this third set of criteria dealing with equity, the first and third reviewers responded "N/A" (Not Applicable), the second a "5."

Communicability

The criteria for communicability were: readability, logical flow, organization/ synthesis, consistency, and grammatical correctness.

The first reviewer commented favorably on readability, logical flow, organization, and consistency. Grammatical correctness was not closely checked. The second reviewer voiced positive remarks for all but grammatical correctness. In that instance, it was stated that: (1) some typographical errors existed; and (2) the use of "number" and "numeral" was reversed at times.

The third reviewer offered the following comments:

1) The guide only lists objectives. There is little communication about the objectives;

2) Readability appears appropriate;

3) While the product is logically organized, the psychological flow can be called into question. As an example, teaching comparison of volumes in second grade is too early and should be reserved for later;

4) In regard to organization, an informative and readable summary is needed;

5) Grammatical correctness appears acceptable.

In terms of rating this fourth set of criteria dealing with communicability, the first reviewer gave it a "4," the second a "5," and the third a "1."

Appeal

The criteria for appeal were: attractive layout, appealing title.

No comments were offered by either the first or third reviewers. The second reviewer voiced positive remarks for appeal, attractive layout, and appealing title.

In terms of rating this fifth set of criteria dealing with appeal, the first and third reviewers responded with a "3." The second reviewer gave it a "5."

Overall Quality

Reviewers were asked to judge the overall quality of the math program objectives Reviewer one rated it a "3.5." The second reviewer gave a "5." The third reviewer a "2."

Along with judging the overall quality, the reviewers were asked to make recommendations for revision. The first two reviewers suggested the guide be left "as is."

The third reviewer suggested, on the contrary, that major revisions be made and that the guide be reviewed subsequently. The rationale put forth in support of this recommendation was that:

1) major additions are needed to convey the philosophical and psychological guidelines on which the curriculum is based;

2) objectives need to be added and the sequence of objectives needs to be reexamined.

Recommendations of Reviewers

The first reviewer commented in conclusion about the impressive scope of the curriculum. This same individual seemed to stress the importance of both computational and conceptual skills. Reviewer two had similar remarks about the curriculum's comprehensiveness. It was this reviewer's feelings that few KDES students will be able to complete all of the objectives included in the guide.

The third reviewer suggested that:

1) introductory material include

   - philosophical and psychological guidelines
   - structure of the curriculum (sequencing considerations, areas of inclusion)
   - general goals of mathematics instruction
   - how the guide can be used in the classroom; methodological suggestions
   - pitfalls to avoid

2) additional objectives be included which suggest instructional development

3) each objective be examined in terms of its appropriateness vis-a-vis level and prerequisite.

It is important to note that all three reviewers felt that their offered suggestions should be specifically accounted for during the subsequent revision effort. Of the three broad comments given by reviewer three and listed above, that reviewer felt most strongly about comment one, introductory material. It was this individual's thinking that, above all else, the introduction should clearly define how the guide should be used in the classroom and offer appropriate methodological suggestions.

Actions Taken by Revision Team

The revision team carefully considered and addressed each suggestion offered by each reviewer. Almost all recommendations made by the first two reviewers were accepted. In response to the third reviewer, the team made changes related to the recommendations pertaining to:

- how the guide should be used in the classroom
- making objectives more clear and specific
- polishing record-keeping, management considerations, and
- the structure of the curriculum (sequencing considerations).

It is proposed that KDES and non-KDES users of the Program Objectives offer ongoing reactions regarding the guide's work and useability. In this manner, it is expected that the guide can be made a more practical and relevant contribution to the mathematics' teacher and classroom.

INSTRUCTIONS FOR NETWORKING

MATHEMATICS CURRICULUM GUIDE

he recording of the child's achievements on the Curriculum Network is done in the following manner:

EXPOSURE TO CONCEPT

This indicates that the child has been exposed to a given concept but is not required to make specific identifications, recall information, or be evaluated in this area.

CONCEPT ATTAINMENT

This indicates that the child is able to demonstrate acquisition of the concept. Concept attainment takes into consideration:

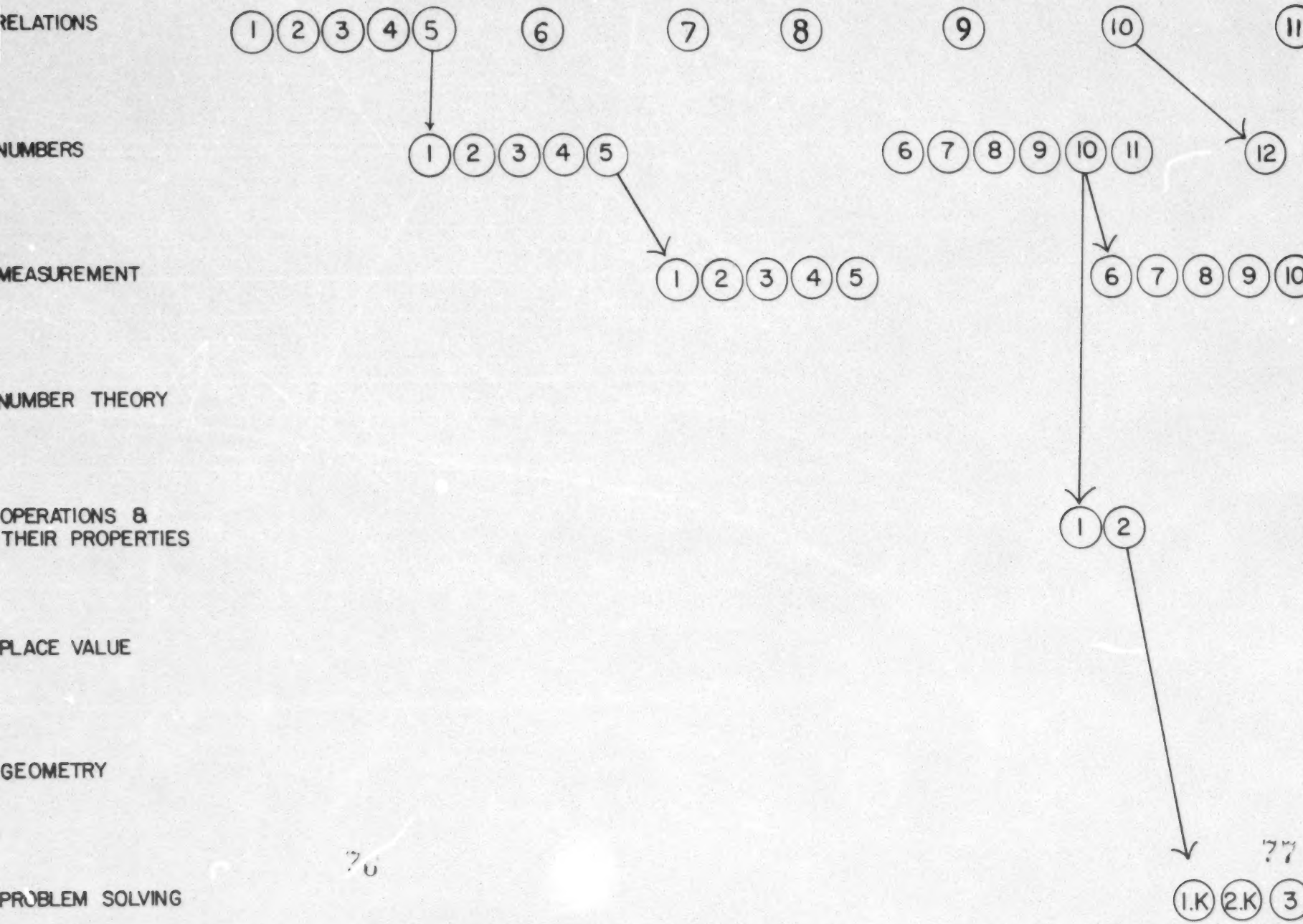
- Concept identification: child already knows the concept class area, now identifies the concept to be applied or named.
- Concept formation: child learns the meaning of a concept not previously known.

CONCEPT EXPRESSION

This indicates that the child is able to convey the concept in some linguistic form. This implies that the individual is able to assimilate, organize and categorize information and respond appropriately in some linguistic form.

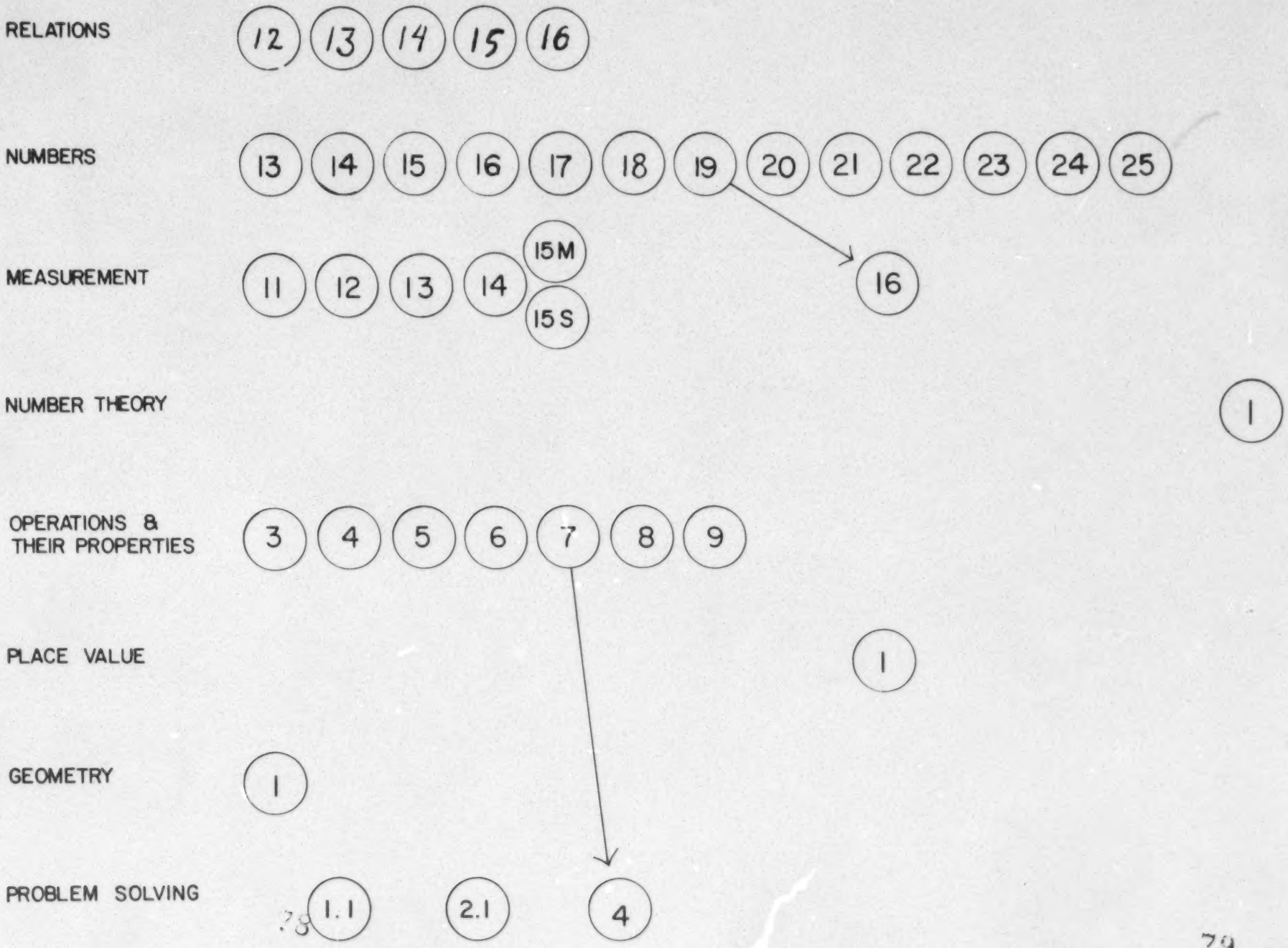
MATH

TEACHER GUIDE SHEET · PRE-SCHOOL/KINDERGARTEN



MATH

TEACHER GUIDE SHEET · FIRST GRADE



MATH

TEACHER GUIDE SHEET · SECOND GRADE

RELATIONS 17 18 19 20 21 22

NUMBERS 26 27 28 29 30

MEASUREMENT 17 18 19 20 21 22 23 24 25 26 27M 27S 28

NUMBER THEORY 2 3 4 5

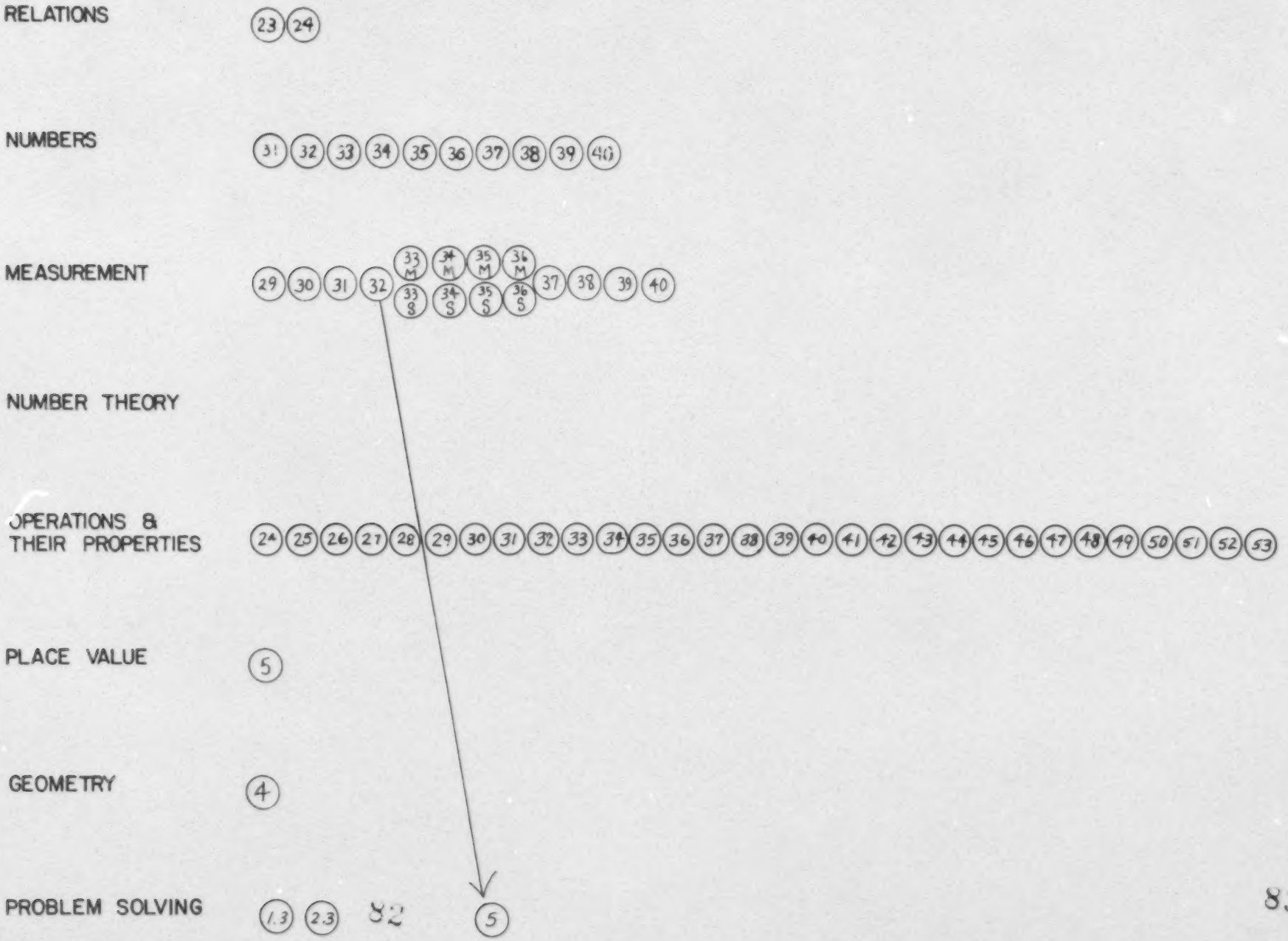
OPERATIONS & THEIR PROPERTIES 10 11 12 13 14 15 16 17 18 19 20 21 22 23

PLACE VALUE 2 3 4

GEOMETRY 2 3

PROBLEM SOLVING 1.2 2.2

MATH
TEACHER GUIDE SHEET THIRD GRADE



MATH

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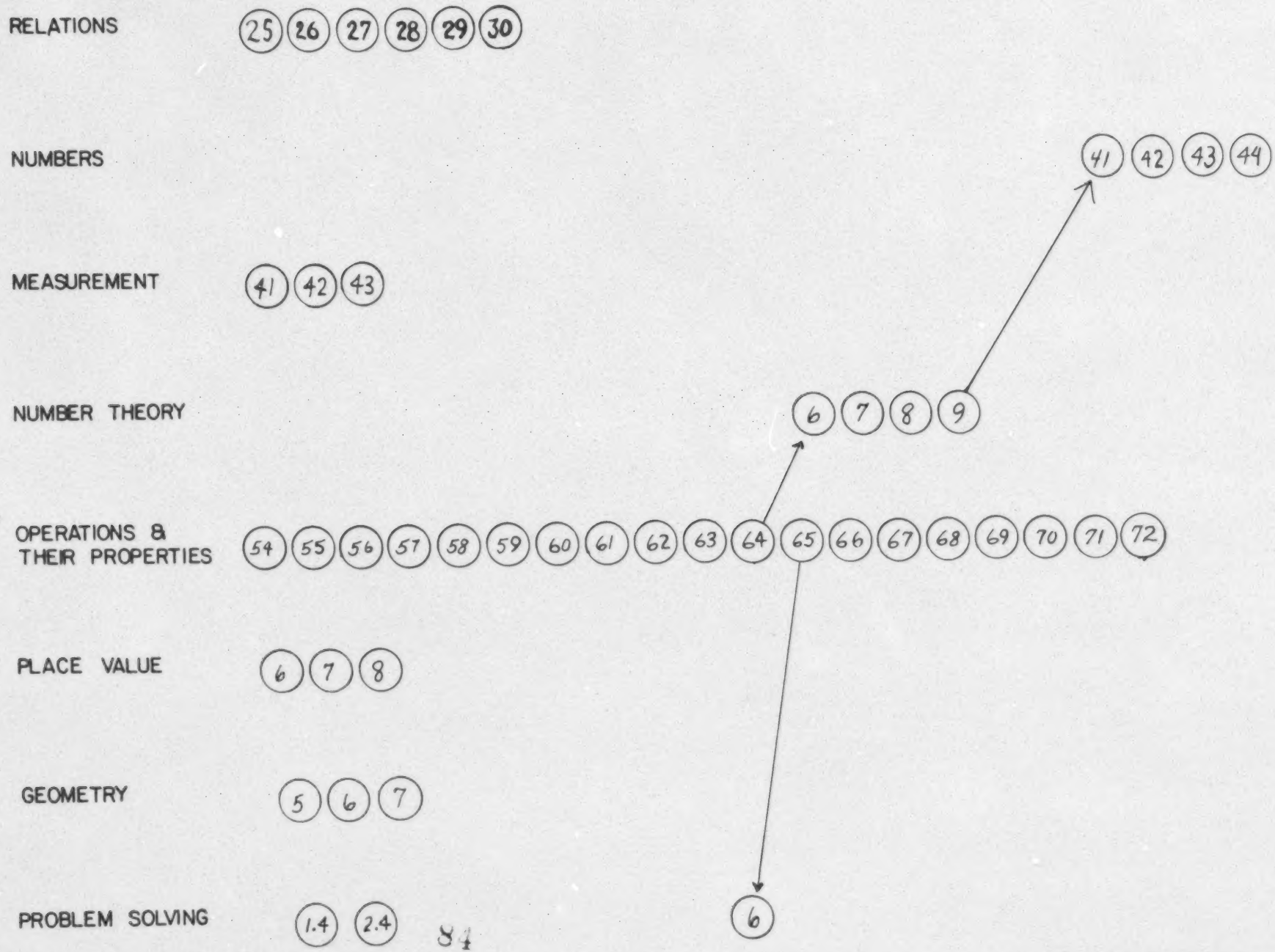

MATH

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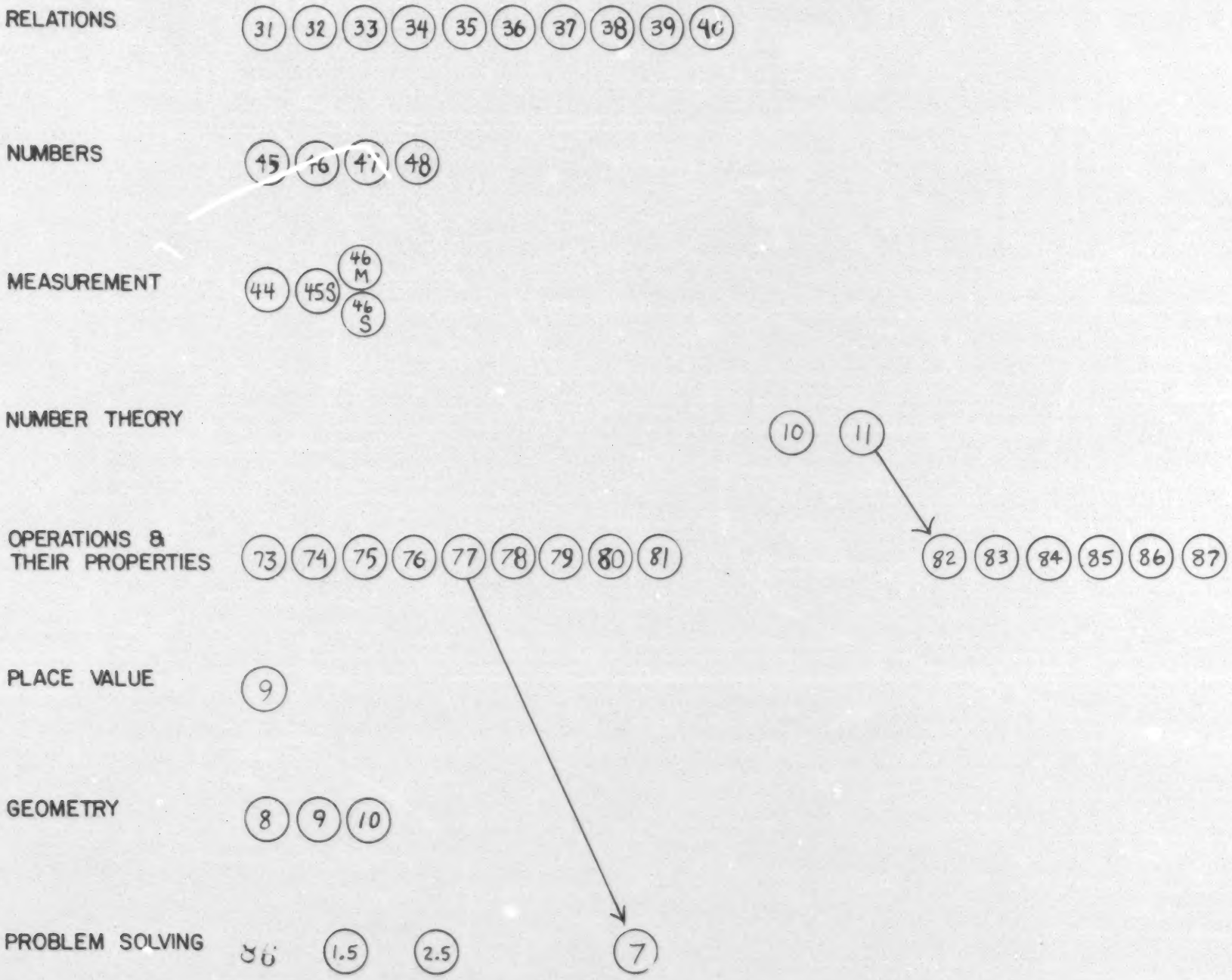

MATH

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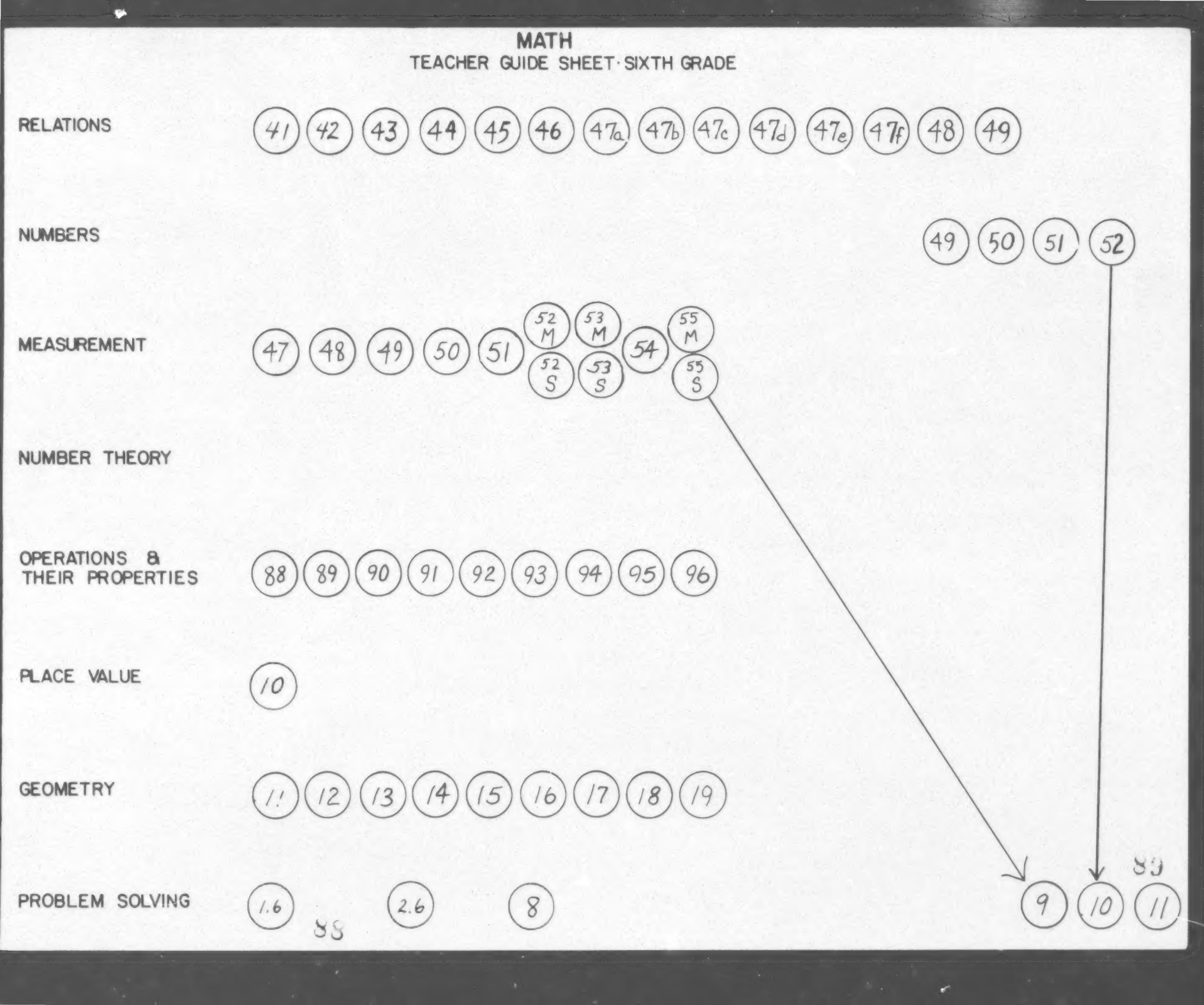

Evaluation Form
KDES Program Objectives for Math
(To be completed by non-KDES personnel)

Name of Reviewer _____ Date _____

Position _____ Organization _____

Please answer each question carefully. Information received will be used in revising the Program Objectives for future use.

1. Did the Program Objectives cover all areas of the KDES Math program about which you desired information?

   _____ Yes _____ No

   If no, please specify other information desired. _____

   _____

   _____

2. Was the information presented at the right level of specificity?

	Not Enough Detail	Right Amount	Too Detailed
Scope	1	2	3
Philosophy and Principles	1	2	3
Structure	1	2	3
General Instructional Principles	1	2	3
Specific Instructional Procedures	1	2	3
Evaluation Procedures	1	2	3
Description of Evaluation Forms	1	2	3
Personnel and Their Roles	1	2	3
The Math Curriculum Itself	1	2	3

   Comments: _____

   _____

   _____

3. Do you intend to use all or part of the KDES program in your educational setting?

   _____ Yes _____ No

   Please comment. _____

   _____

   _____

Please complete and return this form to: Director, Instructional Development & Evaluation Center, Gallaudet College, Washington, D.C. 20002